3.0 ALTERNATIVES CONSIDERED

3.1 THE "NO ACTION" ALTERNATIVE

The existing Tolchester Channel, including the S-Turn, would be maintained at its current depth, width, and alignment. The No Action alternative is the continuation of navigation in the existing Tolchester Channel S-Turn. Use of the S-Turn, however, involves continued risk of groundings, particularly during adverse weather conditions, due to the three to five course changes required within a 3-mile section of channel, and the close proximity of the channel to the shoreline. The existing S-Turn is longer and not as efficient as the proposed realignment. In addition, pilots would not be able to use the new Tolchester Channel navigation range lights, which were constructed by the U.S. Coast Guard during the Fall 2000 and put into operation on January 18, 2001. Therefore, the No Action alternative would not achieve the objective of providing full safe navigational use of the area to commercial vessels, would not increase shipping efficiency at the Port of Baltimore, and would continue to pose an increased risk of vessel groundings and potential environmental damage.

3.2 ALTERNATIVE CHANNEL ALIGNMENTS AND DIMENSIONS

Three potential alternatives were considered: (1) widening the turns in the existing S-Turn channel, (2) realigning the S-turn to eliminate one of the turns, and (3) straightening the S-Turn by dredging a new, straight channel. These are described below.

There are three distinct turns in the dredged portion of the Tolchester Channel S-Turn and another turn at the northern end of the S-Turn, off Tolchester Beach, where the water is naturally deeper than 35 feet. USACE design guidance recommends widening turns to provide safe navigation based upon the severity of the turn. The turns in the dredged portion of the S-Turn range from 17 to 32 degrees. The District widened these turns in 1981 and 1992 to improve navigation safety. The turns currently range from 1,120 to 1,250 feet wide and meet or exceed the USACE design guidance for channel widths in individual turns. Additional widening of the turns will not significantly improve navigation safety since the channel will still come within 1,000 feet of the shoreline and vessels will still be required to change course three to five times within the three-mile channel length. However, the S-Turn is a series of successive turns with no straight reaches between the turns. The S-Turn, therefore, does not meet USACE design criteria, which recommends that successive turns be separated by straight reaches of channel to allow pilots to steady the vessels prior to starting maneuvers for another turn. The length of the straight reaches should be at least five times the vessel length, which would be approximately one mile long based on the 965-foot container vessels using the channel. While further widening of the turns would require considerably less dredging than straightening the S-Turn, the improved S-Turn would still include the same number of turns, require the pilots to make three to five course changes within a short distance, and would not significantly improve navigation safety or meet design criteria for safe, successive turns.

Minor realignment of the S-Turn to eliminate one of the turns was also considered. This alternative would require significantly more dredging than widening the existing turns, but less dredging than straightening the channel. Realigning the channel to eliminate a turn would improve navigation safety, however, vessels will still be required to change course three times within the 3-mile channel length and the realigned S-Turn would not meet the USACE design criteria for safe, successive turns.

Straightening the S-Turn would eliminate three turns and leave one turn at the northern end of the S-Turn. It would also move the channel further from the shoreline. The Baltimore District performed an analysis to select the appropriate channel dimensions for a new straight channel using criteria specified in EM 1110-2-1613, "Hydraulic Design of Deep-Draft Navigation Projects." The results indicated that the current Tolchester Channel dimensions of 35 feet deep and 600 feet wide would be appropriate for the straightened channel. The Waterways Experiment Station performed ship simulation studies to evaluate channel dimensions and channel alignments, and the U.S. Coast Guard performed a Relative Risk Assessment to evaluate the existing S-Turn and proposed realignment. The simulation studies evaluated various ship sizes passing through the most practicable configuration at various speeds. The ship simulation studies and U.S. Coast Guard risk assessment confirmed that realigning and straightening the S-Turn would provide a safer channel and that the width of 600 feet was appropriate for two-way traffic. The new channel will be cut west of the existing S-Turn, resulting in some sections of the channel and vessel traffic being nearly one-half mile farther from shore than the existing channel. These simulation studies and relative risk assessment may be found in Appendices B and C, respectively of the Baltimore Harbor and Channels, Maryland and Virginia, 42-Foot Project, Tolchester Channel S-Turn Navigation Assessment Report. A limited number of hard copies are available upon request from Mr. Jeffrey McKee of the Baltimore District USACE.

The U.S. Coast Guard completed construction of range lights south of the Tolchester Channel to mark the centerline of the straight portion of the existing Tolchester Channel to improve navigation safety. Straightening the S-Turn would allow pilots to use the new range lights in the northern reach of the Tolchester Channel. Widening of the turns or realigning the S-Turn in any configuration other than a straight channel would not allow the pilots to take advantage of the range lights.

Three types of dredging alternatives were considered for dredging of the proposed project. The existing materials could either be moved mechanically (by clamshell dredge), hydraulically (by pipeline), or by hopper dredge. Mechanical dredging involves digging the material out of an area and placing it onto a specialized barge called a scow. The scow is then pushed to a placement site by tug, and the material in this case, would be pumped directly from the scow into a containment cell. Hydraulic dredging involves creating a slurry of dredged material using water and pumping the material to the placement site or (occasionally) a scow. Because the preferred placement site (Poplar Island) is over 30 miles away from the straightening area, hydraulic dredging with direct pumping to the site is impractical. A hydraulic dredge could potentially be used to pump the material directly to Hart-Miller Island, since the site is approximately 5 miles away.

A hopper dredge removes material hydraulically and retains it in the hull of the vessel. When the vessel is full it travels to the placement area where the material could be released from the hull or could be pumped into the placement area. Due to the long distance between the dredging and placement areas and prohibition on overflowing material from scows or hopper dredges, the use of a hopper dredge is not economically feasible for this project. Therefore, the project will most likely be dredged by clamshell dredge.

3.3 ALTERNATIVES FOR DREDGED MATERIAL PLACEMENT

The Baltimore District and MPA have cooperated in an extensive effort to identify dredged material placement alternatives. Many are currently at the initial stages of study and development and would not be available for this action. Under the terms of local cooperation for the project the State of Maryland is required to provide suitable placement site(s) for dredged material. The State has provided Hart-Miller Island and/or Poplar Island for this project. These are described below.

Baltimore District is proposing to place the 3 mcy of material that would be generated by this proposed action in one of two existing facilities. The State of Maryland will provide either the 640-acre Poplar Island (Phase I) Environmental Restoration Project (located in Talbot County) or the 800-acre North Cell of the 1,140-acre HMI Containment Facility (located in the upper Chesapeake Bay near the mouth of Back River in Baltimore County) for the placement of material from the proposed dredging. Dredged material from future maintenance dredging of the straightened channel will also be placed at these facilities until the capacity is exhausted or until a new placement site is brought on line. Under present conditions (i.e., use of HMI or Poplar Island), there is adequate (designed) capacity to maintain this and the other approach channels for approximately 8 years. Poplar Island is the preferred placement site for this action, since the material is suitable for placement in that location, there is adequate capacity, and the capacity of HMI could be conserved for material from the Inner Harbor (which must be contained by State of Maryland Law). Either alternative could provide capacity for future maintenance of the straightened S-Turn.

3.3.1 Poplar Island

Since Poplar Island, like many islands in the Chesapeake Bay, is currently eroding, it was determined that island restoration/creation could be an ideal solution for the dredged material capacity need that the Port of Baltimore is facing while also restoring valuable habitat. Offshore islands are a unique ecosystem component in the Chesapeake Bay watershed. Although similar vegetative communities may occur on the mainland, isolation, lack of human disturbance, and fewer predators make islands more desirable as nesting sites for colonial waterbirds and some endangered species.

The group of islands known as Poplar Island is located in the upper-middle Chesapeake Bay, approximately 34 nautical miles southeast of the Port of Baltimore and 1 mile northwest of Tilghman, Talbot County, Maryland. A project to reconstruct Poplar Island

to its approximate size in 1847 using dredged material from the Chesapeake Bay Approach Channels to the Baltimore Harbor and Channels Federal Navigation Project has been developed through cooperative efforts of many State and Federal agencies, as well as public and private organizations. The recommended plan would create a 1,140-acre dredged material placement area within a 35,000-foot perimeter. This area would then be filled with dredged material obtained from periodic maintenance and new work dredging of the Chesapeake Bay Approach Channels of Federal navigation projects that serve the Port of Baltimore, and will be developed into low and high marsh wetlands and upland habitat. The projected site capacity associated with the authorized plan is 38 mcy, which was expected to be placed over a period of 24 years. The site is now expected to be filled within 8 to 9 years. The site would consist of 50 percent tidal wetlands, of which 80 percent would be low marsh and 20 percent would be high marsh, and 50 percent uplands with an elevation up to +20 feet MLLW. An Environmental Impact Statement (EIS) prepared in 1996 by the Baltimore District stated that the Poplar Island site is considered environmentally acceptable for placement of dredged material from the Tolchester Channel. Based upon the test results of the dredged material from the proposed Tolchester Channel straightening discussed in Section 4.1.5, the material would be satisfactory for placement at Poplar Island.

Poplar Island dike construction was proposed to occur in two phases, each of which would be ready to receive materials upon completion. Phase I is approximately 640 acres and constitutes the northern section of the island. Construction of Phase I is complete and the facility was ready to receive material in March 2001. Construction of Phase II began in Summer 2000. This phase is not expected to be completed and on-line until Fall 2001. Phase II, therefore, may also be available for the materials removed from straightening the S-Turn, and would be available for future maintenance dredging needs for the proposed project.

3.3.2 Hart-Miller Island

Description

HMI is located in the Upper Chesapeake Bay, north of the mouth of the Patapsco River. The site is approximately 14 miles due east of Baltimore City, near the mouth of Back River in Baltimore County. Construction of the placement site began in 1981 and was completed in December 1983. Since 1984, HMI has been used for placement of dredged material removed from Baltimore Harbor, Chesapeake Bay Approach Channels, and Baltimore County dredging projects. HMI covers 1,140 acres, has approximately 6 miles of dike, and is oval shaped, approximately two miles long and one mile wide (see Figure 1-3).

The sand dikes were originally constructed to an elevation of +18 foot above mean low water (MLW), 164 feet wide at MLW, with 3 horizontal (H) to 1 vertical (V) outer slopes, and 5H to 1V inner slopes. The dike has a 20-foot roadbed on top, and the outer side slopes are protected by a revetment up to elevation +13 feet, consisting of filter cloth on the sand dike, covered by a layer of gravel, which is covered by a layer of riprap

weighing up to 8,500 pounds per stone along the sides exposed to the Chesapeake Bay (see Figure 1-3). The original 18-foot-high dikes were raised an additional 10 feet to a height of 28 feet above MLW during Summer and Fall 1988 to provide additional capacity for the completion of the Baltimore Harbor and Channels 50-foot deepening project. The 1,140-acre oval placement site was projected to hold approximately 62 mcy of dredged material to an elevation of +25 feet. The +28-foot raised portion of the dike has 2H:1V outer slopes, 3H:1V inner slopes, with a 10-foot roadbed on top. MPA increased the dike height of the north cell to 44 feet in summer 1997. This will provide up to an additional 30 million cubic yards of capacity at an approximate placement rate of 2.5 mcy per year. The +44-foot raised portion of the dike has 2H:1V outer slopes, 3H:1V inner slopes, with a 10-foot roadbed on top. This would provide sufficient capacity for this proposed action.

After the north cell reaches capacity, it will be developed to provide recreational opportunities and habitat. The permit issued by Baltimore District for the original construction of HMI stipulates that, "Provision shall be made for a park combining intensive environmental and recreational facilities, low intensity use areas, open green space areas, and fish and wildlife recreational areas. Consideration shall be given to possible cultural activities on the site. As part of the open space concept, productive marshes shall be included within the project area."

State law required the south cell to stop receiving dredged material in October 1990 when the 50-Foot project was completed. The State implemented a crust management and grading program to prepare the south cell foundation for recreational development. USACE completed a study with MDNR as the local sponsor to determine restoration alternatives for the south cell. The study recommended converting the south cell into 200 acres of wetlands and mudflat habitat. Construction is scheduled for Fall 2001. The north cell is required to stop receiving dredged material by December 31, 2009.

Permits and Monitoring

Environmental monitoring at the HMI facility has been conducted since before construction began in 1981. Several different environmental permits control the operations. Information on permits is given below. The State and Federal agencies administering permits require that the owners and operators of HMI operate the facility in an environmentally sound manner.

A State Discharge Permit, issued by the Maryland Department of the Environment (MDE), controls and regulates the quality of effluent discharged from the facility and sets monitoring requirements. This permit has been modified to allow raising of the north cell dikes to 44 feet.

Each of the five outfall locations at HMI is permitted as a point source discharge, with monitoring requirements and discharge limitations for pH, total suspended solids (TSS), and five metals. There are additional monitoring requirements for the outfall being used as a primary discharge location. The purpose of this sampling is to provide an in-depth

analysis of the discharges from the site. This requires the semi-annual analysis of more than 120 other potential contaminants. This monitoring is also repeated in adjacent Bay waters. Aquatic toxicity testing of the effluent is performed every 6 months. Sampling of the benthos around the site has indicating there has been no accumulation of contaminants in tissues. In the first 7 years of operation, there were a total of 13 violations on 11 dates of discharge permit limits. A list of these violations may be found in Table 3-1. Most of the discharges were for exceedance of permitted limits for pH and TSS. No violations have occurred since 1993.

Table 3-1
Effluent Non-Compliance Violations at Hart-Miller Island

Date	Violation	Spillway #	Limit
11/04/1993	pH below 6.0 for 65 minutes	002	6.0
06/09/1993	Cadmium concentration of 0.231 mg/L	002	0.2 mg/L daily maximum
06/11/1990	TSS of 1,159 mg/L	001	800 mg/L daily maximum
06/06/1990	TSS of 1,254 mg/L	002	800 mg/L daily maximum
10/04/1989	TSS of 437 mg/L	003	400 mg/L daily maximum
09/30/1989	TSS daily maximum of 90,460 mg/L	003	400 mg/L daily maximum
	Monthly average of 3,202 mg/L		200 mg/L monthly average
07/24/1989	TSS daily maximum of 3,219 mg/L	003	400 mg/L daily maximum
	Monthly average of 254 mg/L		200 mg/L monthly average
10/26/1988	pH above 10.0 for 85 minutes	001	10.0
10/19/1988	pH above 10.0 for 80 minutes	001	10.0
08/03/1988	pH above 10.0 for 130 minutes	001	10.0
04/22/1988	pH above 9.0 for 8 hours	001	9.0

In 1993 a daily maximum non-compliance for total cadmium occurred during the reporting period at Outfall 002. The permitted daily maximum is 0.2 milligrams per liter (mg/L) and the concentration in the discharge was 0.231 mg/L. Maryland Environmental Service (MES) conducted extensive monitoring of levels of metals in the ponded water and soils, to attempt to determine the cause of the non-compliance. MES concluded that the rise in metals concentrations at spillways 001, 001A, and 002 was a result of the oxidization of the sulfidic dredged material and extended crust management activities during an 18-month hiatus from dredged material inflow. Coordination with MDE indicated that this one-time release of cadmium was not considered to be a cause for concern. No other violations have occurred since then.

A Tidal Wetlands License issued by the Board of Public Works prior to construction of the placement site sets guidelines for development of HMI into a recreational area and requires monitoring of the effects of operations on the environment and on resources outside the facility. This permit has been modified to allow raising of the north cell dikes to 44 feet. Principal investigators from the University of Maryland, the Maryland

Department of the Environment, and the Maryland Geological Survey under contract to MPA perform this monitoring. The monitoring efforts were supervised by MDNR and are presently supervised by MDE.

The Tidal Wetlands License also requires that the operator monitor wells in the dike of the facility. This is done on a monthly basis and is reported to the HMI Technical Review Committee (TRC). A report prepared by the University of Maryland in January 1999 provides the following information on the monitoring wells: (1) there are some elevated levels of trace metals in the samples from the wells but, except for zinc, most were found at low levels; (2) high concentrations of dissolved iron were found; and (3) pH within the wells was found to be "normal" (neutral), therefore, low concentrations of metals are expected; it seems unlikely that there would be large fluxes of metals in groundwater at HMI (UMCES 1999). The report further indicates that considering the elevated contaminant concentrations in some of the sediments deposited at HMI, the geochemical environment at HMI appears to promote retention of most metals, except perhaps iron and zinc (not considering any spillway losses during dewatering). Groundwater output of metals is likely to be small with only zinc, manganese, and iron demonstrating any mobility in these soils.

A Department of the Army Permit contains requirements and oversight provisions for construction and development activities on the site. USACE personnel also perform inspection duties during Federal dredging projects to ensure operational requirements such as freeboard limitation (maintaining a 2-foot separation between the slurry elevation and top of the dike) are enforced. This permit has been modified to allow raising of the dikes to 44 feet.

A Water Quality Certification, issued by MDNR in 1975 (now regulated under MDE), ensures that construction and operations are performed in accordance with the USACE approved plans and Maryland water quality standards. This regulation requires the permit holder to provide adequate sediment erosion control, to prevent fuel spills into the waterway, and to develop crust management techniques and a water quality monitoring system. A National Pollution Discharge Elimination System (NPDES) Permit was issued by MDE, which specifies monitoring and discharge requirements for operating HMI.

A Water Appropriations Permit, issued by MDNR (now regulated under MDE), allows withdrawal of water from the Chesapeake Bay. At HMI, water is used by hydraulic unloaders to slurry and pump dredged material into HMI. Hydraulic dredges entrain water at the dredging sites to pump material directly to HMI. Semi-annual reports are submitted on water used during the previous 6 months.